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A SURVEY OF SPORT FISHING IN THE ILLINOIS PORTION OF LAKE MICHIGAN: APRIL 1990 THROUGH SEPTEMBER 1990

Annual Report F-52-R5

Center for Aquatic Ecology

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IN THE ILLINOIS PORTION OF LAKE MICHIGAN

April 1990 through September 1990

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February 1991

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ABSTRACT

A survey of sport fishing in the Illinois portion of Lake Michigan was conducted from April 1 to September 30, 1990. The survey covered all legal sport fishing during that period except fishing from chartered boats and smelt fishing. It included angling by pedestrians and fishing from boats. The intent of the survey was to provide reliable estimates of sport fishing activity, sport fish harvest, expenditures for sport fishing, and quality of sport fishing. Estimated total fishing effort for pedestrians and boaters was 1.16 million angler-hours. The estimated total harvest included 1,532,000 yellow perch, 4,000 brown trout, 4,000 rainbow trout, 2,000 lake trout, 57,000 coho salmon, and 11,000 chinook salmon. Estimated expenditures for boats, motors, trailers, fishing gear, and automobile gas were $4.95 million. The yield value of the sport fishing harvest was approximately $3.31 million.

Two additional special surveys were conducted. A pre-season creel survey conducted in late March indicated that over 700 brown trout and nearly 3,000 coho salmon were caught by pedestrian and boating anglers during the three weeks preceding the main summer creel survey. In addition, from October 1 to November 18, 1990, a survey of snagging was conducted. Snaggers using the four legal snagging areas fished for 33,558 hours, catching 3,067 chinook salmon and insignificant numbers of other species.

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I INTRODUCTION

This report summarizes a survey of sport fishing in the Illinois portion of Lake Michigan from April 1 to September 30, 1990. The survey covered all types of legal sport fishing during that period, with the exceptions of charter-boat fishing and smelt fishing. In addition, two supplemental surveys were conducted: 1) A limited creel survey was conducted during the three weeks preceding April 1. 2) A survey of snagging was conducted from October 1 to November 18. Those surveys are reported in Appendices C and D. The intent of the project was to provide reliable estimates of sport fishing activity, sport fish harvest, expenditures for sport fishing, and quality of sport fishing. Results from the first five years of this series of annual surveys were reported elsewhere (Horns and Gorden 1986, Horns and Gorden 1988, Horns 1988, Horns 1989, Horns and Brofka 1990). The most recent preceding creel survey of this type in Illinois was conducted in 1979 by Bruce Muench (Muench 1981).

Geographic Setting

The geographic setting of this survey is illustrated in Figure 1. The area under the jurisdiction of Illinois includes 63 miles of Lake Michigan shoreline. This area is highly developed and heavily industrialized. Chicago covers roughly one-third of the shoreline, and a series of smaller cities cover almost all of the remainder. This section of Lake Michigan lacks significant tributary streams. A geographic feature that influences the distribution and success of sport fishing is the slope of the near-shore lake bottom; the slope becomes progressively steeper as one moves from south to north. This progression means, for example, that boaters from Chicago must go considerably farther from shore to reach good salmon waters than boaters departing from Waukegan.

Distribution of Fishing

Pedestrians and launched boats

The survey recognized 27 fishing areas (Table 1). Helicopter flights in 1985-90 were used to determine the distribution of fishing. The 27 areas accounted for 94.4% of the pedestrian anglers observed in the aerial surveys and 100% of the boat trailers parked near launch areas. Boats launched from the Calumet Yacht Club (25 to 50 launches per week in mid summer) were not included in this survey. In this survey interviews were conducted at eight pedestrian fishing areas and four launch areas. The pedestrian areas (Waukegan Power Plant, Waukegan Harbor, Montrose Harbor, Diversey Harbor, Burnham Harbor, McCormick Place, Jackson Park, and Calumet Park) accounted for 66% of the pedestrian anglers observed during the helicopter flights. The four launch areas (Waukegan Harbor, Diversey Harbor, Burnham Harbor east ramp, and Calumet Park) accounted for 44% of the boat trailers observed near launch areas. In 1990 launches from North Point Marina accounted for a substantially larger fraction of all launches than in previous years.

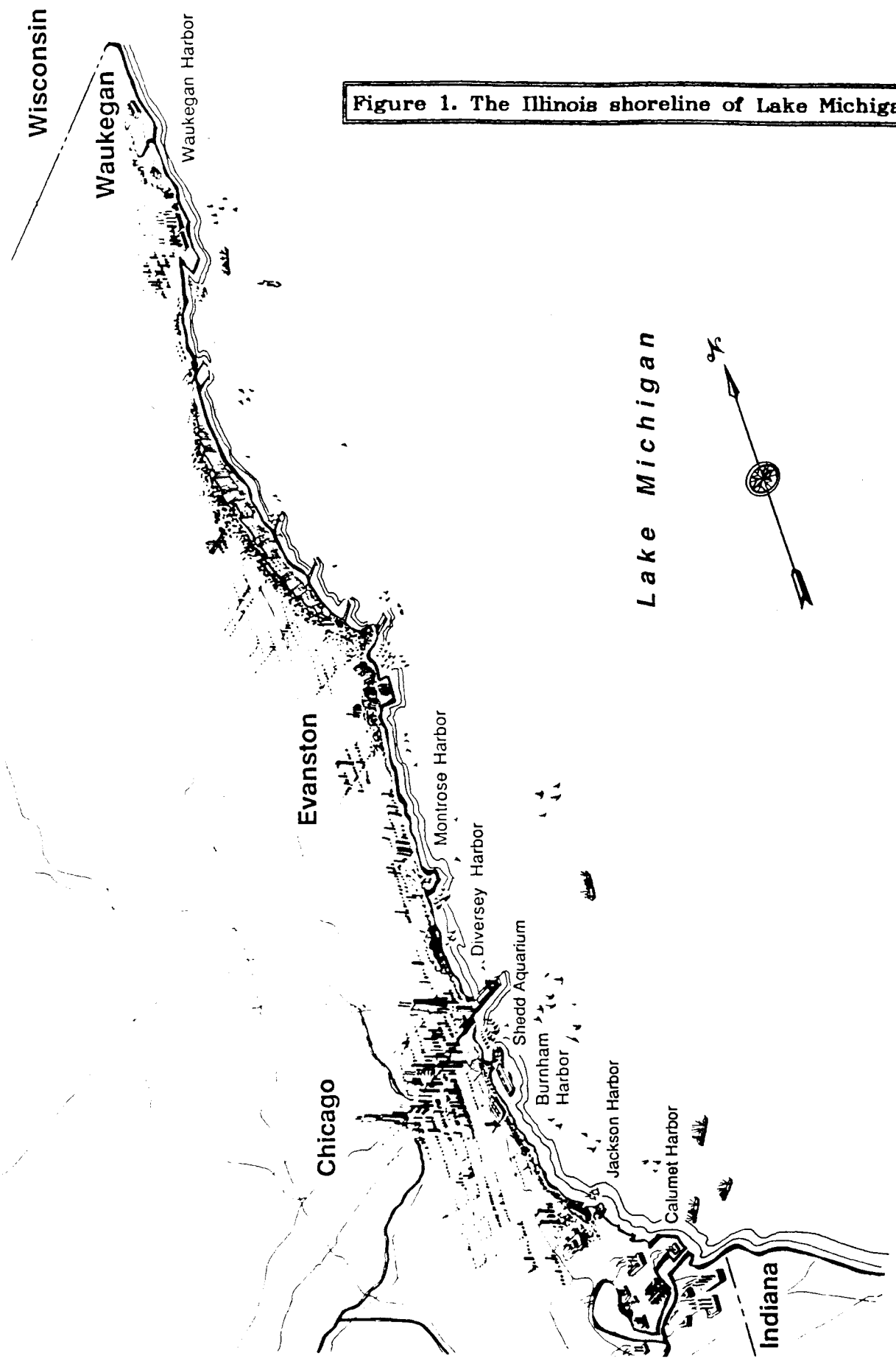

Figure 1. The Illinois shoreline of Lake Michigan.

Table 1. Distribution of pedestrian anglers and boat trailers (1990).

AREA	PEDESTRIAN ANGLERS (%)	BOAT TRAILERS (%)
1. Ill. Beach State Pk & (North Pt. Marina)	0.7	29.9
2. Waukegan Power Plant discharge and pier	3.6	0.0
3. Waukegan Harbor and breakwalls	11.3	15.4
4. Great Lakes Naval Training Station	3.0	2.1
5. Forest Park	0.3	2.8
6. Central Park	0.5	3.0
7. Winnetka (Lloyd and Tower Parks)	1.6	1.1
8. Wilmette Harbor	1.7	0.0
9. Northwestern Univ. and Dawes Park	1.9	5.8
10. Farwell Avenue pier	1.3	0.0
11. Hollywood Avenue pier	1.1	0.0
12. Foster Avenue pier	0.6	0.0
13. Wilson Avenue ramp	0.0	1.3
14. Montrose Harbor and breakwalls	32.3	0.0
15. Belmont Harbor	4.5	0.0
16. Diversey Harbor and breakwalls	4.1	11.6
17. North Avenue pier	1.1	0.0
18. Navy Pier	1.9	0.0
19. Monroe Street breakwalls	2.3	0.0
20. Burnham Harbor and vicinity	7.2	(E) 6.7 (W) 8.4
21. McCormick Place seawall	1.9	0.0
22. 31st Street pier	1.6	0.0
23. 50th Street access area	0.4	0.0
24. 59th Street Harbor	1.2	0.0
25. Jackson Park Harbor and breakwall	4.8	0.7
26. Rainbow Park	0.8	0.5
27. Calumet Park	2.7	10.7
28. other areas	5.6	0.0

Moored boats

The principal boat mooring areas are North Point Marina, Waukegan Harbor, Great Lakes Naval Training Station, Wilmette Harbor, and the Chicago Park District harbors. This survey did not include boats kept at moorings or on land in the Calumet or Chicago river systems. In this survey we used the numbers of power boats kept at moorings as an index of fishing activity from moored non-charter power boats. Table 2 summarizes the distribution of moored power boats. Although some fishing occurs from sail boats, we assumed that it was a negligible portion of all fishing. The only private lift service that we included in the survey was that of Larsen Marine (referred to as I/O service in Table 2), which operates in Waukegan Harbor.

Table 2. Distribution of moored non-charter power boats.

MOORING AREA	NUMBER OF POWER BOATS
North Point Marina	**579**
Waukegan Harbor	**531**
Public Moorings	411
Larsen Marine I/O service	120
Great Lakes Naval Training Station	**68**
Wilmette Harbor	**92**
Chicago Park District	**1960**
Diversey	690
Burnham	502
other harbor moorings	768

II METHODS

The following groups were considered separately: (1) Pedestrian and launched-boat anglers. These anglers could be studied directly through personal interviews and direct head counts conducted between 1 April and 30 September. (2) Anglers using moored boats. The data presented here are based entirely on extrapolations from estimates for anglers using launched boats.

Pedestrians and Launched-boat Anglers

Estimates were made for selected *primary fishing areas*, and those estimates were extrapolated to less heavily fished areas. For each primary fishing area, a stratified random sampling design similar to that suggested by Malvestuto (1983) was used. The fishing day was the primary sampling unit. Daily estimates of variables of interest (total catch by species, expenditures by category, etc.) for each primary site were combined to form seasonal estimates using the formula for stratified random samples given by Cochran (1977).

Use of primary fishing areas

The primary fishing areas for pedestrian anglers were Waukegan Power Plant, Waukegan Harbor, Montrose Harbor, Diversey Harbor, Burnham Harbor, McCormick Place, Jackson Park, and Calumet Park. The primary fishing areas for launched boats were Waukegan Harbor, Diversey Harbor, Burnham Harbor (east ramp), and Calumet Park. For each day of work, a creel clerk was assigned to visit three areas, two pedestrian areas and one launch area, in a prescribed order. The three areas were always one of four groups: (1) Waukegan Harbor (pedestrians), Waukegan Power Plant (pedestrians), Waukegan Harbor (launched boats); (2) Montrose Harbor (pedestrians), Diversey Harbor (pedestrians), Diversey Harbor (launched boats); (3) Burnham Harbor (pedestrians), McCormick Place (pedestrians), Burnham Harbor east ramp (launched boats); and (4) Jackson Park (pedestrians), Calumet Park (pedestrians), Calumet Park (launch ramps). The primary fishing areas accounted for 66% of pedestrian fishing and 44% of fishing from launched boats (Table 1). Estimates obtained for the primary fishing areas were extrapolated to all other areas based on the distributions of pedestrian anglers and boat trailers.

Selection of dates in a stratified random sample

The summer fishing season (1 April through 30 September 1990) was stratified by time period and type of day. Each date fell within one time period and was either a working day or a nonworking day (weekends and holidays). The following 16 strata were formed:

1. working days 4/1 - 4/21	2. nonworking days 4/1 - 4/21
3. working days 4/22 - 5/12	4. nonworking days 4/22 - 5/12
5. working days 5/13 - 6/2	6. nonworking days 5/13 - 6/2
7. working days 6/3 - 6/23	8. nonworking days 6/3 - 6/23
9. working days 6/24 - 7/14	10. nonworking days 6/24 - 7/14
11. working days 7/15 - 8/4	12. nonworking days 7/15 - 8/4

13. working days 8/5 - 8/25	14. nonworking days 8/5 - 8/25
15. working days 8/26 - 9/15	16. nonworking days 8/26 - 9/15
17. working days 9/16 - 9/30	18. nonworking days 9/16 - 9/30

Within each stratum dates were selected at random. This sampling process was conducted separately for each of the four groups of three areas. Three dates were selected from each stratum except 17 and 18; in those strata, which were several days shorter than the others, fewer than three dates were selected for each group of areas. All areas in each group were visited on the dates selected for that group.

Data collection

Data collection at pedestrian fishing areas consisted of counting all pedestrian anglers at the start and finish of a two-hour interview period and interviewing a representative sample of anglers during the two hours. For four of the primary pedestrian areas (Waukegan Harbor, Montrose Harbor, Burnham Harbor, and Jackson Park) the interview period was always 6:00 a.m. to 8:00 a.m.; for the other four (Waukegan Power Plant, Diversey Harbor, McCormick Place, and Calumet Park) the interview period was always 8:30 a.m. to 10:30 a.m. Each interview was designed for one angling party (i.e., one or more anglers fishing together) rather than for one individual angler. At launch ramps the number of angling boats returning to the ramp between 11:00 a.m. and 1:00 p.m. were counted and a representative sample of all returning fishing parties were interviewed.

The interviewers (referred to as creel clerks) gathered information related to effort (number of angler-hours, number of angler-trips), expenditures for the present fishing trip (by category: major = boat, motor, or trailer; minor = fishing gear; other = auto gas @ 10 cents per mile), species sought, and catch (by species). In previous years "minor" expenditures by pedestrians averaged $4.53 per angler-trip and "other" expenditures by pedestrians averaged $1.67 per angler-trip. For launched-boat anglers the corresponding values were $10.59 and $2.12. Those average expenditures were applied to 1990 anglers. Clerks also weighed and measured fish in possession of the anglers and noted clipped fins. The data form and instructions to creel clerks are reproduced in Appendix A.

Variables measured for each date

The data collected in the interviews on one date at one area were reduced to a set of variables describing daily fishing activity: (1) *Catch per angler-hour* was determined for each species and was the number of fish caught by all parties interviewed divided by the number of hours of fishing by individuals in those parties. (2) *Expenditures per angler-trip* was determined in each of three categories (major, minor, and other). For "major" expenditures total expenditures by all anglers interviewed was divided by the number of anglers interviewed. For "minor" and "other" expenditures, average expenditures per angler-trip was derived from past creel survey data. (3) *Angler-hours* (i.e., total time spent fishing by all anglers) and (4) *angler-trips* (i.e., total number of anglers who fished) were determined

differently for pedestrians and boaters. For pedestrians, angler-hours was the average number of anglers (at start and finish of interviews) multiplied by the number of hours in the day (from 0.5 hour before sunrise to 0.5 hour after sunset), and angler-trips was angler-hours divided by the average duration of a pedestrian fishing trip (4.31 hours for all interviews with conventional pedestrian anglers during the 1987 survey). The number of fishing boats launched for the day was estimated by multiplying the number of fishing boats landing during the two-hour interview period by the estimated average ratio of the number of all boats returning in a day to the number returning between 11:00 a.m. and 1:00 p.m. That ratio was estimated to be 3.13 by monitoring all boat traffic at one of three launch ramps on 47 days in 1985, 1986, 1987, and 1988. Angler-trips was then estimated as the total number of boats launched for the day multiplied by the average number of anglers per boat (2.77, based on data from 1987). Angler-hours was taken as angler-trips multiplied by the yearly average number of hours per angling trip by boaters (5.25, based on data from 1987). (5) *Catch* was determined for each species as catch per angler-hour multiplied by angler-hours, and (6) *expenditures* was determined for each category as expenditures per angler-trip multiplied by angler-trips.

Expansion of daily estimates

The formula given by Cochran (1977) for stratified random samples was employed to expand the daily estimates to form seasonal area-specific estimates of effort, catch, and expenditures.

Seasonal averages of catch per angler-hour were obtained for each primary fishing area by taking unweighted averages of daily values. In these calculations, seasonal averages for yellow perch included only data from anglers who were fishing for perch, and seasonal averages for salmonids included only data from anglers who were fishing for salmonids.

Extrapolation to other areas

Extrapolations of seasonal estimates for primary fishing areas to other areas were based on the distributions of pedestrian anglers and boat trailers (Table 1). The distribution of boat trailers was assumed to reflect the distribution of launched-boat anglers. In the extrapolations, catch, effort, and expenditures at areas not visited were estimated by extension of results for the nearest primary fishing areas. Thus, for pedestrian anglers, results for Waukegan Harbor were extended to all other areas (except Waukegan Power Plant) north of and including Wilmette Harbor; results for Montrose Harbor were extended to all remaining areas north of Diversey Harbor; results for Diversey Harbor were extended to all remaining areas north of the Monroe Street breakwalls; results for Burnham Harbor were extended to all remaining areas north of McCormick Place, including the west ramp in Burnham Harbor; results for McCormick Place were extended to all remaining areas north of 31st Street; results from Jackson Park were extended to all remaining areas north of Rainbow Park; and results from Calumet Park were extended to all remaining areas south of (and including) Rainbow Park. For launched boats, results for Waukegan Harbor were extended to all launch ramps north of Wilmette (including the "other" areas listed in Table 1); results for Diversey

were extended to Dawes Park and the Wilson Avenue ramps; results for Burnham Harbor east ramp were extended to Burnham Harbor west ramp; and results for Calumet Park were extended to ramps at 59th Street Harbor, Jackson Park, and Rainbow Park.

Moored Boats

To estimate effort, catch, and expenditures by anglers using moored boats, estimates for launched boats were extrapolated. First, the ratios of moored fishing boats to launched fishing boats for Waukegan Harbor, Diversey Harbor, and Burnham Harbor (east ramp) were estimated. On several dates during the summers of 1987 and 1988 counts were made of the numbers of fishing boats returning to moorings and to Larsen Marine I/O service at Waukegan Harbor while simultaneous counts were made of the number of fishing boats returning to the launch ramp. Charter boats were excluded from the counts. The ratio of moored to launched boats was 0.83 in Waukegan Harbor. In similar series of counts, the ratios were 0.92 in Diversey Harbor and 1.38 in Burnham Harbor (east ramp). Using these figures, seasonal estimates of effort, catch, and expenditures by anglers using launched boats at Waukegan, Diversey, and Burnham harbors were extrapolated to moored boats. Thus, for example, the moored boat catch at Waukegan Harbor for a given time period was estimated to be the launched boat catch for that time period multiplied by 0.83. Values so derived for Waukegan, Diversey, and Burnham harbors were then extrapolated to other moored boats based on the distribution of moored power boats (Table 2). Estimates for Waukegan Harbor were extrapolated to boats moored in North Point Marina, Wilmette Harbor, and Great Lakes Naval Training Station, and the combined estimates for Diversey Harbor and Burnham Harbor were extrapolated to all other boats moored in Chicago.

Yield Values

Here the term *yield value* means the hypothetical market price of the sport fish harvest. For salmonids, approximate market prices of whole fish, headed and gutted were used. For yellow perch market prices of fillets were used. The estimated catch for each species was multiplied by the average individual weight of fish weighed in our survey. That estimated harvested round weight was then multiplied by a factor to estimate the harvested market weight. For salmonids, the factor was 0.75 because approximately 25% of the weight of a salmonid is in the head and viscera. For yellow perch the factor was 0.40 because approximately 60% of the fish is wasted in the filleting process. Total harvested marketable weight was then multiplied by approximate market prices (Table 9).

Missing Data

On some dates creel clerks were unable to complete their assigned interviews. When data were missing from some but not all of the assigned dates in a stratum, estimates for the stratum were based on data from the completed dates. No special formula was used, but the sample size was smaller than for strata where all interviews were completed.

III RESULTS

All estimates derived in this survey are often given here without qualification; for simplicity of expression, the word "approximately" is not repeated with each estimated value. Estimates are rounded in the following paragraphs.

Total fishing effort in the Illinois portion of Lake Michigan during the study period was 1.16 million angler-hours, with 68% of that attributable to summer pedestrian anglers. Anglers caught 1,532,000 yellow perch, 4,000 brown trout, 4,000 rainbow trout, 2,000 lake trout, 57,000 coho salmon, and 11,000 chinook salmon. Expenditures for boats, motors, trailers, fishing gear, and automobile gas used on Lake Michigan fishing trips during the study period were $4.95 million. The yield value of the Illinois sport fishing harvest was $3.31 million.

Detailed results are presented in Tables 3 - 11. Tables 3 and 4 summarize all expenditure, catch, and effort estimates. Tables 5a, 5b, and 6 list seasonal catch and effort estimates for pedestrians and anglers using launched boats. Tables 7a, 7b, and 8 present catch rates for pedestrians and launched boaters. Table 9 provides yield values. Table 10 presents average weights of the six most important species, with separate estimates given for the catch of boaters, and pedestrians. Fin clips observed by our creel clerks are listed in Tables 11a and 11b, with the number of occurrences of each clip or clip combination listed by season and angler type.

Pedestrian Fishing

During the summer of 1990, pedestrian anglers made over 183,000 trips to Lake Michigan and spent 791,000 hours fishing. Yellow perch was the predominant species in their catch, with a harvest of 1,393,000 fish. Montrose Harbor was the most productive area, with 33% of the summer harvest of yellow perch by pedestrians, although catch rates by anglers fishing for yellow perch at Waukegan Harbor often exceeded those at Montrose Harbor during the mid-summer period of best fishing for yellow perch. Coho salmon was the next most important species for summer pedestrians, with a catch of 8,000. Pedestrian anglers spent $831,000 ($4.53 per trip) for fishing gear and $306,000 ($1.67 per trip) for automobile gas.

Fishing by Boaters Using Launched Boats

Anglers who used launched boats made over 45,000 trips to Lake Michigan and spent 238,000 hours fishing. The most abundant species in their catch were coho salmon (31,000), yellow perch (98,000) and chinook salmon (4,000). For Pacific salmon, Waukegan Harbor was the most productive of the four primary launch areas, accounting for 22% of the coho salmon and 22% of the chinook salmon taken by anglers who used launched boats. But it is likely that, with North Point Marina showing the largest numbers of trailers (Table 1), landings there exceeded those at any other launch area. Expenditures by anglers using launched boats reached over $2,695,000 ($59 per trip), with 79% of that amount going for boats, motors, and trailers.

Fishing by Boaters Using Moored Boats

Our estimates for boaters using boats kept at moorings were derived by extrapolation from estimates for boaters using launched boats. This group of anglers caught 18,000 coho salmon and 2,500 chinook salmon, and spent nearly $1,120,000 for boats, motors, trailers, fishing gear, and automobile gas (we do not include mooring costs here).

Yield Values

The estimated yield values of the three most popular sport species were $1,542,000 (yellow perch), $1,167,000 (coho salmon), and $463,000 (chinook salmon).

Minor Species

In addition to the species for which results are presented in detail in Tables 3-11, creel clerks reported several other species of fish in possession of anglers: **channel catfish** (1 from the Calumet Park boat ramps); **smallmouth bass** (4 from Jackson Park Harbor, 3 from the Montrose Harbor piers); **common carp** (33 from the Waukegan Power Plant discharge channel, 2 from the Jackson Park Harbor); **bluegill sunfish** (2 from Diversey Harbor, 1 from the McCormick Place seawall, 2 from Burnham Harbor, 3 from Montrose Harbor); **pumpkinseed sunfish** (1 from Diversey Harbor); unspecified **sunfish** (4 from Diversey Harbor); **rock bass** (6 from Burnham Harbor, 9 from Calumet Park, 23 from Diversey Harbor, 6 from Jackson Park harbor, 1 from Montrose Harbor); unspecified **crappie** (1 from Montrose Harbor, 2 from Diversey Harbor, 1 from Burnham Harbor); **black crappie** (1 from Montrose Harbor); **freshwater drum** (9 from the Waukegan Power Plant discharge channel, 7 from Jackson Park Harbor, 1 from Diversey Harbor); **white sucker** (3 from the Waukegan Power Plant discharge channel); unspecified **sucker** (3 from Waukegan Power Plant discharge channel); **brook trout** (1 from the Waukegan Power Plant discharge channel); **white perch** (1 from Calumet Park boat ramps); and other unspecified representatives of the genus **Morone** (4 from Calumet Park boat ramps). Anglers also caught alewives for use as bait.

Table 3. Effort (angler-trips) and expenditures (major, minor, and other).

TYPE OF ANGLER	AREA	EFFORT (trips)	major (boat etc)	minor (gear)	other (travel)
Pedestrians	Wau.Power	4,899	$0	$22,191	$8,181
	Wau.Harbor	20,565	$0	$93,161	$34,344
	Montrose	60,807	$0	$275,456	$101,548
	Diversey	8,108	$0	$36,728	$13,540
	Burnham	11,296	$0	$51,171	$18,865
	McCormick	4,031	$0	$18,260	$6,732
	Jackson	4,545	$0	$20,590	$7,591
	Calumet	8,293	$0	$37,565	$13,849
	other	60,902	$0	$275,889	$101,708
	TOTALS	**183,446**	**$0**	**$831,012**	**$306,356**
Launched boats	Waukegan	8,273	$392,280	$87,615	$18,119
	Diversey	2,332	$6,031	$24,696	$5,107
	Burnham	2,098	$5,278	$22,220	$4,595
	Calumet	6,930	$637,682	$73,388	$15,177
	others	25,760	$1,074,051	$272,801	$56,415
	TOTALS	**45,394**	**$2,115,321**	**$480,720**	**$99,413**
Moored Boats	**TOTALS**	**24,752**	**$803,173**	**$262,115**	**$54,205**
SUMMER TOTALS (rounded)		**253,592**	**$2,918,000**	**$1,574,000**	**$460,000**

Table 4. Effort (anglers-hours) and catch (by species).

TYPE OF ANGLER and AREA		EFFORT (hours)	yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
Peds	Wau.Pow.	21,113	15,691	290	302	0	14	9
	Wau.Har.	88,636	239,272	920	42	0	1,695	1,081
	Montrose	262,078	453,771	95	193	0	3,368	496
	Diversey	34,944	54,492	29	17	0	19	115
	Burnham	48,686	73,922	122	162	0	478	450
	McCorm.	17,374	28,309	0	57	0	0	55
	Jackson	19,590	35,963	0	0	0	65	339
	Calumet	35,741	17,386	10	0	0	94	0
	other	262,489	474,241	1,104	510	0	2,706	1,672
	TOTALS	**790,651**	**1,393,047**	**2,570**	**1,284**	**0**	**8,438**	**4,216**
Lau'd	Waukeg.	43,435	12,374	256	371	384	6,863	912
	Diversey	12,243	4,006	28	76	47	1,549	278
	Burnham	11,016	4,413	30	75	7	920	102
	Calumet	36,382	33,975	136	52	31	1,818	143
	others	135,241	43,003	718	1,085	1,015	19,684	2,624
	TOTALS	**238,317**	**97,771**	**1,168**	**1,659**	**1,483**	**30,833**	**4,060**
Moo'd	**TOTALS**	**129,944**	**40,682**	**621**	**1,023**	**852**	**18,094**	**2,468**
SUMMER TOTALS		**1,158,911**	**1,531,500**	**4,359**	**3,966**	**2,336**	**57,365**	**10,744**

Table 5a. Effort and catch by pedestrian anglers (northern areas).

TIME PERIOD	AREA	EFFORT (angler-hours)	CATCH yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
4/1-	Wau'Power	2,853	0	213	173	0	0	0
4/21	Wau'Harbor	2,490	0	69	0	0	81	0
	Montrose	14,232	200	95	95	0	2,254	0
	Diversey	625	37	29	0	0	19	0
	others	9,731	96	321	203	0	782	0
4/22-	Wau'Power	3,976	0	0	63	0	0	0
5/12	Wau'Harbor	4,605	0	0	42	0	873	0
	Montrose	15,167	7,910	0	18	0	531	0
	Diversey	1,259	1,123	0	0	0	0	0
	others	13,303	3,480	0	101	0	821	0
5/13-	Wau'Power	2,222	109	0	53	0	0	0
6/2	Wau'Harbor	5,996	5,362	33	0	0	410	0
	Montrose	34,771	120,538	0	0	0	0	0
	Diversey	4,850	14,408	0	0	0	0	0
	others	21,940	54,733	25	53	0	308	0
6/3-	Wau'Power	1,366	258	55	0	0	14	0
6/23	Wau'Harbor	15,855	44,802	462	0	0	310	0
	Montrose	46,800	130,959	0	0	0	583	0
	Diversey	6,114	15,372	0	0	0	0	0
	others	33,377	88,604	402	0	0	428	0
6/24-	Wau'Power	3,962	2,643	22	0	0	0	0
7/14	Wau'Harbor	22,427	51,129	261	0	0	0	0
	Montrose	54,254	88,199	0	0	0	0	0
	Diversey	8,018	17,644	0	0	0	0	0
	others	44,942	84,402	218	0	0	0	0
7/15-	Wau'Power	3,171	12,680	0	0	0	0	0
8/4	Wau'Harbor	20,347	126,203	0	0	0	0	0
	Montrose	48,079	91,699	0	80	0	0	0
	Diversey	5,685	5,279	0	17	0	0	0
	others	38,568	140,800	0	41	0	0	0
8/5-	Wau'Power	1,110	0	0	13	0	0	0
8/25	Wau'Harbor	5,455	1,945	0	0	0	0	0
	Montrose	24,157	11,622	0	0	0	0	0
	Diversey	2,714	424	0	0	0	0	0
	others	15,189	5,474	0	13	0	0	0
8/26-	Wau'Power	1,157	0	0	0	0	0	0
9/15	Wau'Harbor	7,018	9,831	0	0	0	0	534
	Montrose	11,849	2,394	0	0	0	0	350
	Diversey	3,174	149	0	0	0	0	46
	others	12,973	8,260	0	0	0	0	551
9/16-	Wau'Power	1,295	0	0	0	0	0	9
9/30	Wau'Harbor	4,444	0	95	0	0	22	547
	Montrose	12,769	251	0	0	0	0	146
	Diversey	2,505	56	0	0	0	0	70
	others	10,867	129	71	0	0	17	527

Table 5b. Effort and catch by pedestrian anglers (southern areas).

TIME PERIOD	AREA	EFFORT (angler-hours)	CATCH yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
4/1-	Burnham	1,696	0	47	0	0	426	0
4/21	McCormick	73	0	0	0	0	0	0
	Jackson	683	0	0	0	0	65	0
	Calumet	3,452	0	10	0	0	94	0
	others	2,731	0	28	0	0	323	0
4/22-	Burnham	875	15	0	0	0	0	0
5/12	McCormick	522	175	0	0	0	0	0
	Jackson	175	497	0	0	0	0	0
	Calumet	2,048	0	0	0	0	0	0
	others	1,440	552	0	0	0	0	0
5/13-	Burnham	1,747	1,046	47	0	0	0	0
6/2	McCormick	1,075	1,419	0	0	0	0	0
	Jackson	1,693	4,101	0	0	0	0	0
	Calumet	1,746	2,151	0	0	0	0	0
	others	3,472	5,742	25	0	0	0	0
6/3-	Burnham	6,684	14,451	0	0	0	0	0
6/23	McCormick	3,305	8,236	0	0	0	0	0
	Jackson	5,538	19,722	0	0	0	0	0
	Calumet	10,992	10,330	0	0	0	0	0
	others	13,538	32,969	0	0	0	0	0
6/24-	Burnham	12,039	16,020	0	0	0	0	0
7/14	McCormick	4,239	11,969	0	0	0	0	0
	Jackson	6,085	8,760	0	0	0	0	0
	Calumet	9,355	3,093	0	0	0	0	0
	others	16,634	21,357	0	0	0	0	0
7/15-	Burnham	11,896	36,530	0	95	0	0	0
8/4	McCormick	3,608	4,319	0	0	0	0	0
	Jackson	2,318	2,790	0	0	0	0	0
	Calumet	3,301	1,315	0	0	0	0	0
	others	10,636	23,723	0	51	0	0	0
8/5-	Burnham	5,188	5,398	0	67	0	0	0
8/25	McCormick	2,225	1,780	0	30	0	0	0
	Jackson	952	12	0	0	0	0	0
	Calumet	2,800	177	0	0	0	0	0
	others	5,187	3,387	0	43	0	0	0
8/26-	Burnham	2,864	462	0	0	0	0	0
9/15	McCormick	714	410	0	0	0	0	0
	Jackson	925	81	0	0	0	0	0
	Calumet	1,628	319	0	0	0	0	0
	others	3,163	535	0	0	0	0	0
9/16-	Burnham	5,696	0	29	0	0	52	450
9/30	McCormick	1,612	0	0	26	0	0	55
	Jackson	1,220	0	0	0	0	0	339
	Calumet	420	0	0	0	0	0	0
	others	4,797	0	15	7	0	28	593

Table 6. Effort and catch by anglers using launched boats.

TIME PERIOD	AREA	EFFORT (angler-hours)	CATCH yellow perch	brown brown	r'bow trout	lake trout	coho salm'	chin salm'
4/1-	Waukegan	1,978	0	21	0	0	146	14
4/21	Diversey	825	0	10	10	0	51	0
	Burnham	593	0	5	5	0	51	11
	Calumet	7,662	1,243	90	0	0	1,062	7
	others	7,090	136	74	12	0	582	49
4/22-	Waukegan	7,800	0	76	62	0	2,901	12
5/12	Diversey	1,484	0	0	39	0	431	19
	Burnham	2,119	523	25	5	0	421	0
	Calumet	6,740	1,976	18	0	0	477	0
	others	24,045	865	226	188	0	8,192	42
5/13-	Waukegan	6,545	57	11	220	11	2,091	57
6/2	Diversey	2,517	0	0	0	0	748	0
	Burnham	1,510	400	0	14	0	82	0
	Calumet	2,819	953	12	11	0	173	0
	others	20,315	746	30	575	29	5,880	144
6/3-	Waukegan	5,699	11	88	7	43	914	15
6/23	Diversey	1,161	2,540	5	18	5	91	7
	Burnham	971	134	0	12	0	313	6
	Calumet	4,686	13,001	0	0	0	67	0
	others	16,874	3,169	227	45	113	2,769	50
6/24-	Waukegan	8,038	2,335	36	26	87	394	29
7/14	Diversey	1,407	1,096	0	9	0	128	0
	Burnham	1,708	1,004	0	14	7	51	12
	Calumet	5,928	7,124	0	0	0	19	0
	others	24,003	8,613	92	90	228	1,144	88
7/15-	Waukegan	4,084	9,480	0	5	149	370	461
8/4	Diversey	1,999	129	0	0	23	99	23
	Burnham	1,477	1,599	0	0	0	0	0
	Calumet	2,433	7,774	0	13	6	13	0
	others	13,676	26,940	0	15	391	1,000	1,182
8/5-	Waukegan	2,054	194	5	5	75	30	83
8/25	Diversey	1,241	241	0	0	19	0	206
	Burnham	898	617	0	0	0	0	0
	Calumet	2,695	1,053	0	0	24	7	49
	others	7,375	1,522	11	11	204	76	342
8/26-	Waukegan	4,311	297	0	40	19	16	234
9/15	Diversey	539	0	13	0	0	0	0
	Burnham	882	136	0	0	0	0	48
	Calumet	2,205	850	0	28	0	0	39
	others	12,592	1,013	8	105	49	42	657
9/16-	Waukegan	2,927	0	18	5	0	0	8
9/30	Diversey	1,071	0	0	0	0	0	23
	Burnham	857	0	0	26	0	0	26
	Calumet	1,214	0	17	0	0	0	48
	others	9,271	0	48	44	0	0	72

Table 7a. Catch rates by pedestrian anglers (northern areas). For yellow perch, only data from anglers fishing for yellow perch were used. For the five salmonid species, only data from anglers fishing for salmonids were used. Asterisks represent instances when creel clerks found no anglers fishing for the species in question.

TIME PERIOD	AREA	CATCH PER ANGLER-HOUR yellow perch	brown trout	rainbow trout	lake trout	coho salmon	chinook salmon
4/1-	Wau' Power	*	0.073	0.078	0.000	0.000	0.000
4/21	Wau' Harbor	*	0.029	0.000	0.000	0.018	0.000
	Montrose	2.288	0.003	0.003	0.000	0.127	0.000
	Diversey	0.000	0.030	0.000	0.000	0.000	0.000
4/22-	Wau' Power	*	0.000	0.009	0.000	0.000	0.000
5/12	Wau' Harbor	*	0.000	0.006	0.000	0.203	0.000
	Montrose	0.396	0.000	0.051	0.000	0.200	0.000
	Diversey	1.164	0.000	0.000	0.000	0.000	0.000
5/13-	Wau' Power	0.549	0.000	0.017	0.000	0.000	0.000
6/2	Wau' Harbor	0.452	0.008	0.000	0.000	0.107	0.000
	Montrose	3.270	*	*	*	*	*
	Diversey	3.128	0.000	0.000	0.000	0.000	0.000
6/3-	Wau' Power	1.400	*	*	*	*	*
6/23	Wau' Harbor	2.551	0.000	0.000	0.000	1.000	0.000
	Montrose	2.624	0.000	0.000	0.000	1.034	0.000
	Diversey	1.885	*	*	*	*	*
6/24-	Wau' Power	0.615	0.000	0.000	0.000	0.000	0.000
7/14	Wau' Harbor	2.005	*	*	*	*	*
	Montrose	1.626	*	*	*	*	*
	Diversey	2.147	*	*	*	*	*
7/15-	Wau' Power	3.870	0.000	0.000	0.000	0.000	0.000
8/4	Wau' Harbor	4.615	*	*	*	*	*
	Montrose	1.444	*	*	*	*	*
	Diversey	1.196	*	*	*	*	*
8/7-	Wau' Power	0.000	0.000	0.000	0.000	0.000	0.000
8/25	Wau' Harbor	0.246	*	*	*	*	*
	Montrose	0.445	0.000	0.000	0.000	0.000	0.000
	Diversey	0.029	0.000	0.000	0.000	0.000	0.000
8/26-	Wau' Power	0.000	0.000	0.000	0.000	0.000	0.000
9/15	Wau' Harbor	1.699	0.000	0.000	0.000	0.000	0.092
	Montrose	0.426	0.000	0.000	0.000	0.000	0.053
	Diversey	0.128	0.000	0.000	0.000	0.000	0.010
9/16-	Wau' Power	0.000	0.000	0.000	0.000	0.000	0.006
9/30	Wau' Harbor	*	0.027	0.000	0.000	0.020	0.119
	Montrose	0.327	0.000	0.000	0.000	0.000	0.024
	Diversey	0.896	0.000	0.000	0.000	0.000	0.022

Table 7b. Catch rates by pedestrian anglers (southern areas). For yellow perch, only data from anglers fishing for yellow perch were used. For the five salmonid species, only data from anglers fishing for salmonids were used. Asterisks represent instances when creel clerks found no anglers fishing for the species in question.

TIME PERIOD	AREA	CATCH PER ANGLER-HOUR yellow perch	brown trout	rainbow trout	lake trout	coho salmon	chinook salmon
4/1-	Burnham	*	0.016	0.000	0.000	0.188	0.000
4/21	McCormick	*	0.000	0.000	0.000	0.000	0.000
	Jackson	*	0.000	0.000	0.000	0.076	0.000
	Calumet	*	0.002	0.000	0.000	0.050	0.000
4/22-	Burnham	0.639	0.000	0.000	0.000	0.000	0.000
5/12	McCormick	0.451	0.000	0.000	0.000	0.000	0.000
	Jackson	2.560	*	*	*	*	*
	Calumet	0.000	0.000	0.000	0.000	0.000	0.000
5/13-	Burnham	0.452	0.000	0.000	0.000	0.000	0.000
6/2	McCormick	0.512	0.000	0.000	0.000	0.000	0.000
	Jackson	2.087	*	*	*	*	*
	Calumet	1.105	*	*	*	*	*
6/4-	Burnham	2.896	0.000	0.000	0.000	0.000	0.000
6/23	McCormick	2.200	*	*	*	*	*
	Jackson	3.822	0.000	0.000	0.000	0.000	0.000
	Calumet	0.922	*	*	*	*	*
6/24-	Burnham	2.026	*	*	*	*	*
7/14	McCormick	2.983	*	*	*	*	*
	Jackson	1.291	*	*	*	*	*
	Calumet	0.495	*	*	*	*	*
7/15-	Burnham	2.202	*	*	*	*	*
8/4	McCormick	1.041		*	*	*	*
	Jackson	1.137	*	*	*	*	*
	Calumet	0.401	*	*	*	*	*
8/5-	Burnham	1.005	0.000	0.000	0.000	0.000	0.000
8/25	McCormick	0.865	*	*	*	*	*
	Jackson	0.034	*	*	*	*	*
	Calumet	0.070	*	*	*	*	*
8/26-	Burnham	0.605	0.000	0.000	0.000	0.000	0.000
9/15	McCormick	1.711	0.000	0.000	0.000	0.000	0.000
	Jackson	0.205	0.000	0.000	0.000	0.000	0.000
	Calumet	0.227	0.000	0.000	0.000	0.000	0.000
9/16-	Burnham	*	0.004	0.000	0.000	0.007	0.073
9/30	McCormick	*	0.000	0.008	0.000	0.000	0.019
	Jackson	*	0.000	0.000	0.000	0.000	0.364
	Calumet	0.000	0.000	0.000	0.000	0.000	0.000

Table 8. Catch rates by anglers using launched boats. For yellow perch, only data from anglers fishing for yellow perch were used. For the five salmonid species, only data from anglers fishing for salmonids were used. Asterisks represent instances when creel clerks found no anglers fishing for the species in question.

TIME PERIOD	AREA	CATCH PER ANGLER-HOUR					
		yellow perch	brown trout	rainbow trout	lake trout	coho salmon	chinook salmon
4/1-	Waukegan	*	0.011	0.000	0.000	0.090	0.010
4/21	Diversey	*	0.008	0.008	0.000	0.041	0.000
	Burnham	*	0.005	0.005	0.000	0.090	0.034
	Calumet	2.727	0.007	0.000	0.000	0.183	0.001
4/22-	Waukegan	*	0.021	0.011	0.000	0.674	0.003
5/12	Diversey	*	0.000	0.017	0.000	0.200	0.009
	Burnham	6.469	0.011	0.002	0.000	0.194	0.000
	Calumet	2.994	0.003	0.000	0.000	0.085	0.000
5/13-	Waukegan	0.229	0.001	0.063	0.001	0.335	0.010
6/2	Diversey	*	0.000	0.000	0.000	0.252	0.000
	Burnham	4.000	0.000	0.010	0.000	0.053	0.000
	Calumet	0.583	0.009	0.008	0.000	0.136	0.000
6/4-	Waukegan	0.000	0.020	0.004	0.010	0.138	0.001
6/23	Diversey	3.789	0.010	0.025	0.000	0.101	0.011
	Burnham	2.857	0.000	0.007	0.000	0.232	0.003
	Calumet	3.160	0.000	0.000	0.000	0.111	0.000
6/24-	Waukegan	1.979	0.004	0.004	0.011	0.103	0.007
7/14	Diversey	1.506	0.000	0.010	0.000	0.257	0.000
	Burnham	1.114	0.000	0.014	0.007	0.075	0.016
	Calumet	2.045	0.000	0.000	0.000	0.017	0.000
7/15-	Waukegan	7.050	0.000	0.002	0.038	0.080	0.111
8/4	Diversey	0.066	0.000	0.000	0.008	0.036	0.008
	Burnham	2.453	0.000	0.000	0.000	0.000	0.000
	Calumet	2.770	0.000	0.019	0.010	0.019	0.000
8/5-	Waukegan	1.006	0.003	0.003	0.039	0.016	0.041
8/25	Diversey	0.506	0.000	0.000	0.024	0.000	0.257
	Burnham	0.459	*	*	*	*	*
	Calumet	0.590	0.000	0.000	0.049	0.021	0.099
8/26-	Waukegan	0.877	0.000	0.016	0.003	0.002	0.091
9/15	Diversey	*	0.016	0.000	0.000	0.000	0.000
	Burnham	0.347	0.000	0.000	0.000	0.000	0.083
	Calumet	0.724	0.000	0.012	0.000	0.000	0.044
9/16-	Waukegan	*	0.005	0.000	0.000	0.000	0.000
9/30	Diversey	*	0.000	0.000	0.000	0.000	0.012
	Burnham	*	0.000	0.031	0.000	0.000	0.031
	Calumet	0.000	0.011	0.000	0.000	0.000	0.066

Table 9. Yield values. Yellow perch are assumed to be prepared as fillets with 60% waste and salmonids as whole gutted fish with 25% waste. Prices for all except brown trout are those current in November 1988.

SPECIES	TOTAL CATCH	AVE WT (lbs)	ROUND WT (lbs)	MARKET WT (lbs)	PRICE PER POUND	YIELD VALUE
yellow perch	1,531,500	0.28	428,820	171,528	$8.99	$1,542,037
brown trout	4,359	4.54	19,790	14,843	$2.99	$44,381
rainbow trout	3,966	5.54	21,972	16,479	$3.69	$60,808
lake trout	2,336	7.31	17,076	12,807	$2.99	$38,293
coho salmon	57,365	3.88	222,576	166,932	$6.99	$1,166,855
chinook salmon	10,744	8.22	88,316	66,237	$6.99	$462,997
					COMBINED YIELD VALUE OF ALL SPECIES:	**$3,315,371**

Table 10. Average weights (coho salmon, chinook salmon, rainbow trout, lake trout, brown trout, and yellow perch). Weights are in pounds. Sample sizes (n) are shown. Seasons are defined by the following dates: spring = 4/1-5/12, early summer = 5/13-6/23, midsummer = 6/24-8/4, late summer = 8/5-9/15, early fall = 9/16-9/30. Asterisks represent situations where no fish were measured.

			SPRING	-------SUMMER------			FALL
SPECIES	ANGLER TYPE			early	mid	late	
coho salmon	boaters	ave	2.47	4.10	6.03	7.64	4.46
		n	108	185	85	3	4
	pedestrians	ave	2.58	3.05	*	*	2.57
		n	66	14	0	0	8
chinook salmon	boaters	ave	12.33	5.81	5.64	5.77	7.35
		n	4	5	33	35	11
	pedestrians	ave	*	*	*	9.49	10.95
		n	0	0	0	15	47
rainbow trout	boaters	ave	5.21	7.14	6.54	6.35	5.13
		n	3	12	13	5	2
	pedestrians	ave	5.66	0.35	0.38	0.57	2.37
		n	12	1	3	1	3
lake trout	boaters	ave	*	7.82	6.95	7.52	*
		n	0	5	20	7	0
	pedestrians	ave	*	*	*	*	*
		n	0	0	0	0	0
brown trout	boaters	ave	4.36	5.16	7.05	5.84	1.88
		n	9	7	3	1	2
	pedestrians	ave	4.51	3.90	7.93	1.50	2.09
		n	16	7	1	1	2
yellow perch	boaters	ave	0.18	0.36	0.39	0.33	*
		n	8	122	240	71	0
	pedestrians	ave	0.29	0.26	0.27	0.25	0.21
		n	33	1,268	1,511	234	14

Table 11a. Fin clip summary (coho salmon, chinook salmon, and rainbow trout). Seasons are defined by the following dates: spring = 4/1-5/12, early summer = 5/13-6/23, midsummer = 6/24-8/4, late summer = 8/5-9/15, early fall = 9/16-9/30. Occurrences of clips are shown separately for two types of anglers: boaters (b), and pedestrians (p).

		SPRING		--------SUMMER--------						FALL	
				early		mid		late			
SPECIES	CLIP	b	p	b	p	b	p	b	p	b	p
coho	ad	2	5	3	0	2	0	0	0	0	0
salmon	ad,lp	0	0	0	0	0	0	0	0	0	1
	ad,lp,rv	1	0	0	0	0	0	0	0	0	0
	ad,rp	0	0	1	0	0	0	0	0	0	0
	ad,rv	10	4	12	0	1	0	0	0	0	0
	do	0	0	3	0	0	0	0	0	0	0
	do,rp	1	0	0	0	0	0	0	0	0	0
	lm	0	0	0	1	0	0	0	0	0	0
	lp	1	0	0	0	0	0	0	0	0	0
	lv	0	0	0	1	0	0	0	0	0	0
	rp	9	1	7	0	2	0	1	0	0	0
	rv	0	1	1	0	0	0	0	0	0	0
	no clips	267	63	285	19	99	0	7	0	0	7
chinook	ad	0	0	0	0	0	0	0	2	0	3
salmon	ad,lv	0	0	0	0	0	0	1	0	0	0
	ad,rv	0	0	0	0	1	0	0	0	0	0
	lv	0	0	0	0	0	0	1	0	0	1
	lv,rp	0	0	0	0	0	0	1	0	0	0
	lv,rv	0	0	0	0	1	0	1	0	0	0
	rp	0	0	1	0	0	0	0	2	0	2
	rv	0	0	0	0	0	0	0	0	1	0
	no clips	6	0	6	0	39	0	40	11	10	64
rainbow	ad	0	0	1	0	2	0	0	0	0	0
trout	ad,do	0	0	1	0	1	0	0	0	0	0
	ad,do,lv	0	0	0	0	0	0	1	0	0	0
	do	1	0	0	0	0	0	0	0	0	0
	do,lv,rv	0	0	2	0	0	0	0	0	0	0
	do,rp	0	0	1	0	0	0	0	0	0	0
	fl	0	1	0	0	0	0	0	0	0	0
	lp	0	1	0	0	0	0	0	0	0	0
	lp,rp	0	2	1	0	0	0	0	0	0	0
	lv	0	1	0	0	2	0	0	0	0	0
	lv,rv	1	0	0	0	0	0	0	0	0	0
	no clips	5	9	13	1	7	4	5	1	2	2

Table 11b. Summary of fin clips (lake trout and brown trout). Seasons are defined by the following dates: spring = 4/1-5/12, early summer = 5/13-6/23, midsummer = 6/24-8/4, late summer = 8/5-9/15, early fall = 9/16-9/30. Occurrences of clips are shown separately for two types of anglers: boaters (b), and pedestrians (p).

		SPRING		--------SUMMER--------						FALL	
				early		mid		late			
SPECIES	CLIP	b	p	b	p	b	p	b	p	b	p
lake trout	ad	0	0	0	0	2	0	0	0	0	0
	ad,do	0	0	0	0	1	0	0	0	0	0
	ad,lp	0	0	2	0	8	0	8	0	0	0
	ad,lv	0	0	0	0	0	0	2	0	0	0
	ad,rp	0	0	0	0	3	0	2	0	0	0
	ad,rv	0	0	1	0	2	0	2	0	0	0
	lv	0	0	0	0	1	0	0	0	0	0
	lv,rp	0	0	0	0	8	0	0	0	0	0
	lv,rv	0	0	1	0	1	0	0	0	0	0
	rp	0	0	0	0	0	0	2	0	0	0
	rv	0	0	1	0	0	0	1	0	0	0
	no clips	0	0	0	0	2	0	1	0	0	0
brown trout	lp	2	1	0	0	0	0	0	0	0	0
	lp,rp	0	1	0	0	0	0	0	0	0	0
	rp	0	0	1	0	0	0	0	0	0	0
	no clips	14	16	7	8	3	2	1	1	2	2

IV DISCUSSION

Comparisons with preceding years

These results can be compared with those from 1986 through 1989 (Tables 12 and 13). Yellow perch catch was high in 1986 through 1988, averaging over 1.5 million, but dropped by nearly 50% in 1989. In 1990 the yellow perch harvest recovered to the 1986-88 levels. The 1990 harvest of coho salmon was 66% that of 1989. The coho salmon in 1990 were substantially heavier than in 1989. Fishing for chinook salmon was extremely poor in 1988 but improved slightly both in 1989 and 1990. Estimated expenditures for boats, motors, and trailers, which had jumped markedly between 1987 and 1988, returned to previous levels in 1989 and 1990. Tables 12 and 13 summarize these and other results from this series of creel surveys. Creel survey methods were different in the five years, so comparisons should be made with caution, especially where estimates for anglers using moored boats are concerned.

Table 12. Summer effort and expenditures in 1986 - 1990.

		EFFORT	EXPENDITURES		
TYPE OF ANGLER	YEAR	(angler-trips)	major (boat)	minor (gear)	other (travel)
Pedestrians	1986	299,454	$0	$844,000	$397,000
	1987	289,307	$0	$1,674,000	$475,000
	1988	250,251	$0	$1,133,000	$417,000
	1989	167,396	$0	$758,000	$280,000
	1990	183,446	$0	$831,000	$306,000
Launched Boats	1986	71,009	$2,079,000	$1,598,000	$131,000
	1987	54,043	$2,427,000	$618,000	$119,000
	1988	58,009	$8,061,000	$614,000	$123,000
	1989	40,261	$3,229,000	$426,000	$85,000
	1990	45,394	$2,115,000	$481,000	$99,000
Moored Boats	1986	74,307	$2,022,000	$2,395,000	$138,000
	1987	28,911	$996,000	$363,000	$60,000
	1988	34,321	$5,251,000	$373,000	$73,000
	1989	23,084	$1,449,000	$244,000	$49,000
	1990	24,752	$803,000	$262,000	$54,000
SUMMER TOTALS	1986	444,770	$4,101,000	$4,837,000	$666,000
	1987	372,261	$3,423,000	$2,655,000	$654,000
	1988	344,422	$13,312,000	$2,120,000	$613,000
	1989	230,741	$4,678,000	$1,428,000	$414,000
	1990	253,592	$2,919,000	$1,574,000	$460,000

Table 13. Summer effort and catch in 1986 - 1990.

ANGLER TYPE and YEAR		EFFORT (angler-hours)	CATCH yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
Peds	1986	1,278,678	1,614,979	5,478	2,914	171	20,415	5,455
	1987	1,252,796	1,715,219	10,982	2,486	55	13,101	9,066
	1988	1,077,816	1,636,985	4,912	2,346	33	17,577	3,815
	1989	721,476	819,821	3,599	2,515	0	12,991	3,550
	1990	790,651	1,393,047	2,570	1,284	0	8,438	4,216
Lau'd	1986	386,287	53,316	2,094	2,849	1,030	43,539	11,856
	1987	285,076	84,172	690	811	2,299	14,861	8,266
	1988	304,547	73,999	836	1,545	2,188	32,016	3,556
	1989	262,223	43,132	2,363	1,595	2,544	48,246	4,454
	1990	238,317	97,771	1,168	1,659	1,483	30,833	4,060
Moo'd	1986	404,232	24,973	1,633	3,772	641	52,219	12,482
	1987	151,770	20,964	330	444	1,286	8,855	4,057
	1988	180,186	34,980	485	868	1,446	19,205	2,107
	1989	148,570	21,405	1,272	950	1,537	25,098	2,643
	1990	129,944	40,682	621	1,023	852	18,094	2,468
SUMMER TOTALS	1986	2,069,197	1,693,268	9,205	9,535	1,842	116,173	29,793
	1987	1,689,642	1,820,355	12,002	3,751	3,640	36,817	21,389
	1988	1,572,210	1,747,027	6,269	4,813	3,736	70,123	9,607
	1989	1,132,269	884,358	7,233	5,059	4,081	86,335	10,646
	1990	1,158,911	1,531,500	4,359	3,966	2,336	57,365	10,744

The most important differences between the methods of collecting and analyzing data used in these five years are these: (1) In 1986 six pedestrian areas and three launch areas were visited for interviews; in 1987 through 1990 eight pedestrian areas and four launch areas were visited. Thus higher proportions of total catch, effort, and expenditures were estimated directly in 1987 through 1990 than in 1986, and lower proportions were estimated by extrapolation to areas that were not visited. (2) Several parameters used in deriving estimates are themselves estimated, and the estimated values were different in the five years. Table 14 lists the values of these parameters used each year. (3) The formulae for extrapolating catch, effort, and expenditures by anglers using launched boats to estimate those things for anglers using moored boats were quite different in the five years. This occurred because the estimated ratios of moored boat traffic to launched boat traffic for Diversey Harbor and Burnham Harbors changed greatly between 1986 and 1988 (Table 14) as new data became available. (4) Average expenditures per angler-trip for "minor" and "other" expenditures (see Methods) were not estimated independently in 1989 and 1990, but were derived from previous creel surveys.

Table 14. Parameters used in deriving estimates.			
PARAMETER	1986	1987	1988 - 1990
Duration of fishing trip (hours)			
summer pedestrians	4.27	4.31	4.31
launched boats	5.44	5.25	5.25
Number of anglers per launched boat	2.91	2.77	2.77
Ratio of number of launched boats returning in a day to the number returning between 11:00 a.m. and 1:00 p.m.	3.125	2.94	3.13
Ratio of number of moored boats used for fishing on any day to number of launched boats used for fishing			
Waukegan Harbor	0.82	0.83	0.83
Diversey Harbor	2.39	1.54	0.92
Burnham Harbor (East)	no est	0.34	1.38
Distributions of pedestrian anglers, launched boats, and moored boats (Tables 1 and 2).	Differences between years were slight, except that North Point Marina has become the major port for launching boats.		

Confidence Intervals and Bias

Estimates of catch, effort, and expenditures are presented above without confidence intervals. Confidence intervals presented without estimates of bias are meaningful only if bias is assumed to be negligible, an assumption that we are not willing to make. Although we have collected and will continue to collect data with which to partially assess biases, we are presently unable to make such assessments. Table 14 lists the parameters used in our estimation procedures. Those parameters, to the extent that they are incorrect, introduce bias into the estimation process. Other sources of bias in this survey include the assumption that fishing effort and catch rates during the times of our interview sets (6:00 a.m. to 8:00 a.m. or 8:30 a.m. to 10:00 a.m. for pedestrians; 11:00 a.m. to 1:00 p.m. for launched boat anglers) are, on average, representative of the entire day.

V REFERENCES

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VI APPENDIX A - DATA FORM AND INSTRUCTIONS TO CLERKS

We record data on the **Interview Form** and a modified version of the same. The modified version is sometimes used by a helper in connection with interviews of boaters (see "Instructions to Clerks -- Work Assignments").

One important general rule applies to both forms: "Fill in all the blanks". If you don't know a particular value, draw a diagonal slash through that space on the form. The only exception to this rule is the "numbers in possession" section of the **Interview Form**. In that section, blanks are interpreted as zeros.

Interviews are obtained in sets. For each set, you visit a site and interview a number of angling parties. Each interview involves data for an entire angling party, although you might only speak with one individual angler. The interviews are taken from pedestrian anglers or from boaters returning to a launch ramp.

When pedestrian anglers are being interviewed, interview either all present or all that can be interviewed in the assigned period (usually two hours). Counts of pedestrian anglers are made at the start and finish of the interview set. When all pedestrian fishing parties cannot be interviewed, interview a **representative** sample of the anglers present. Thus, if the site includes harbor, shore, and structure areas (see maps), you interview parties from all three areas in proportion to their numbers. Approach all types of people (men, women, Chinese, hispanic, white, polite, surly, etc.) without special favor for or against any. To assure impartiallity skip a fixed number of anglers between interviews, with the number to skip determined so that the entire site is covered during the interview period. If you encounter an angling party that has already been interviewed in our creel survey that day, skip them.

When counting anglers, ignore spectators (casual passers-by) but include members of the angling party who are not fishing at the moment. This can include family members (spouses and children over five years old) who are accompanying the angler.

When boaters are interviewed, stay at the ramp for a predetermined time (usually two hours) and record data for **all** returning boats. Sometimes it is not possible to interview all angling boats. When that happens, you will interview a representative sample of boats containing anglers. When a boat is not interviewed, you record an ID number (see below), the time (under "interview time"), and one of four notes (in the right-hand margin): "ANI" (anglers - no interview), "PNA" (power - no anglers), "SAIL" (sail boat), and "CH" (charter fishing boat). Counts of trailers are made at the start and finish of the interview period. It is important that the counts indicate the number of trailers at the times when you start and finish your interview set. Sail boats, non-angling power boats, and charter boats are never interviewed.

Record the total number of trailers of **all** types, but only count empty trailers (those without boats on them) with cars attached. Only count trailers at the east ramp area when covering Burnham Harbor.

The interview form has four areas for recording data: 1) Site Data, 2) Party Record, 3) Catch Record, and 4) Fish Record.

1) **Site Data.** This area is a condensed version of the **Instantaneous Counts Form.** Counts are recorded at the start and finish of each interview set. Remember the rule: "Fill in all the blanks". When conducting boat interviews, record slashes in the pedestrian spaces. When conducting pedestrian interviews of any kind, enter a slash in the trailers space. When conducting pedestrian interviews with "regular peds", always enter slashes for all three types of "special peds", and vice-versa.

2) **Party Record** and 3) **Catch Record.** These areas are filled-in during the interviews. Column headings are explained here:

ID - Interviews (and non-interviewed boats) are sequentially numbered. For pedestrians, assign a number to each pedestrian party interviewed. For boaters, assign a number to each boat that returns to the ramp, including those that are not interviewed. Each clerk assigns one series of numbers each day, with no repeats. Thus, for example, when you conduct more than one interview set in a day, **do not** begin the second set with number 1; continue numbering where you left off in numbering the previous set. **Also,** for interview sessions at boat ramps, record the registration number of each boat.

angler type - One of eight mutually exclusive possibilities is circled: har (harbor), sho (shore), str (structure), lau (launched), sna (snagger), smt (smelter), ice (ice-angler), and moo (moored).

angs - For each party record the total number of anglers (tot) and the number who are Illinois residents (res). Remember, as in the **Instantaneous Counts Form,** include members of the angling party who are not fishing at the moment.

lines - For each party record the number of fishing rods (rod) and the number of power lines (pwr) in use by that party. Trolley lines are counted as power lines here.

nets - (ignore)

trip times - Record three times: the time the fishing trip started, the time of the interview, and the time the trip ended (or is expected to end). **Always record times in 24-hour time** (e.g., two o'clock p.m. is 1400). When the fishing trip has started the previous day, still record the time of day that fishing started. Fishing trips by pedestrians are considered to start when the angling party arrives at the shoreline. Fishing trips using boats are considered to start when the boat leaves the ramp and to end when the boat arrives back at the ramp.

expenses - Data are only recorded for boaters, not pedestrian anglers. Remember, the data you record applies to the entire party being interviewed. You record only costs of items acquired since the last fishing trip on Lake Michigan. If this is the first trip that an angler has **ever** made to Lake Michigan, include the total purchase price of all items in each category, regardless of when purchased. Notice that we are not concerned with when the item was paid for, only with when it was acquired and what it cost. 1) For major expenses (maj), record the purchase price of boat, motor, and/or

trailer, **if acquired since the last fishing trip on Lake Michigan.** Include newly purchased used equipment. 2) For minor expenses (min) and other expenses (other) record no data.

sought - Record species sought as p (perch), s (salmonid), ps ("whatever bites"), or o (other specific target species).

numbers in possession - Record only the numbers of fish in possession of the angling party. Fish names are abbreviated as follows: BK - brook trout, BN - brown trout, RB - rainbow trout, LT - lake trout, CO - coho salmon, CH - chinook salmon, YP - yellow perch, SM - smallmouth bass, NP - northern pike. **Accurate identification is extremely important; don't hesitate to use your key if you have any doubt about the identification of any fish.** If the fish in possession of an angling party include some caught at any other site, exclude those from the numbers recorded here.

(no heading) - Ask the angler how many floy tags he/she has seen on perch presently in possession. Record that number here.

4) **Fish Record.** Here you record physical measurements made in connection with the interviews. Above this section you record the time your interview set was scheduled to start (usually 0600, 0830, or 1100). You should be able to weigh, measure, and examine for clips (for purposes of this form, we count floy tags under the heading "clips"), scars, and wounds on **all** salmonids that you encounter in possession of anglers. When an angler has more than 5 yellow perch, select five fish **at random** from the catch to weigh, measure, and examine for floy tags (you don't need to look for clipped fins or lamprey marks on yellow perch). In addition to the five randomly selected perch, record data for any other yellow perch on which the angler has found a floy tag. On some occasions anglers will have removed floy tags from fish before you arrive. If it is not possible to know which specific fish the tag came from, record all information printed on the tag in the margin of the form and **keep the tag.** Column headings are explained here:

ID - Record the same number recorded in "Party Record" for the angling party that caught this fish.

species - Record the two-letter abbreviation of the species name. The abbreviations are those that appear as headings in the "Catch Record" section.

weight - Record the weight of the fish **in grams.** Do not record weights of gutted or beheaded fish. Be sure to "zero" the scale and to use the appropriate scale for the size of the fish being weighed.

length - Record total length (distance from tip of snout to tip of tail) **in centimeters.**

clipped fins - As outlined above you will examine **all** salmonids for clipped fins and floy tags, and you will examine **some** yellow perch for floy tags only. You record abbreviations for what you find (for purposes of data recording, assume that perch never have clipped fins or lamprey scars or wounds). The permitted entries are do (dorsal), ad (adipose), lp (left pectoral), rp (right pectoral), lv (left ventral), rv (right ventral), an (anal), fl (floy tag), lm (left maxillary), rm (right maxillary) and none. **Also,** when you encounter a floy

tag, record all the information printed on the tag. **Remember**, leave no blank spaces on the form; if you are unable to examin the fish, draw diagonal slashes through the spaces.

scars and # wounds - This refers to marks left by sea lampreys; we are not interested in scars and wounds from other causes. The distinction is that wounds are still all or partly red, while scars are not. Since yellow perch are not examined for scars and wounds, always draw slashes through these boxes for perch.

PAGE _____ OF _____

REPORTER _____ LOCATION _____

DATE ____ ____ ____
M D Y

SITE DATA	TIME	REGULAR PEDS			SPECIAL PEDS			TRAILERS
		HAR	SHO	STR	SNA	SMT	ICE	
START								
FINISH								

PARTY RECORD															CATCH RECORD											
ID	ANGLER TYPE (CIRCLE ONE)	# ANGS		# LINES		# NETS			TRIP TIMES			EXPENSES ($)			SOUGHT	NUMBERS IN POSSESSION										
		TOT	RES	ROD	PWR	GILL	DIP	SEINE	BEGIN	INTER-VIEW	END	MAJ	MIN	OTHER		BK	BN	RB	LT	CO	CH	YP	SM	NP	OTHER
	HAR SHO STR LAU SNA SMT ICE MOO																								
	HAR SHO STR LAU SNA SMT ICE MOO																								
	STR LAU MOO																								

TIME (start time of interview set): _____

FISH RECORD						
ID	SPECIES	WEIGHT (g)	LENGTH (cm)	CLIPPED FINS	# SCARS	# WOUNDS

Figure 2. Interview form. The Site Data, Party Record, and Catch Record sections of the form are shown to the left. The Fish Record (back side of the form) is shown below.

VII APPENDIX B - PROJECT F-52-R5 PERFORMANCE REPORT

The foregoing report does not directly discuss progress toward each of the specific objectives listed in the AFA for this project. The purpose of this appendix is to list the jobs defined in that AFA and to comment on progress toward the objectives of those jobs.

Job 1. Interviews

Objective: To gather the necessary information from pedestrian anglers and boaters.

Progress: Completed.

Job 2. Data entry

Objective: To enter data into computer files.

Progress: Completed.

Job 3. Analysis and reporting

Objective: To produce and summarize the desired estimates of fishing effort and harvest.

Progress: Completed.

VIII APPENDIX C - PRE-SEASON SURVEY

A limited creel survey was conducted during the three weeks preceding April 1, the start of the annual summer survey. On March 17 and March 24 (both weekend days), four pedestrian sites (Waukegan Power Plant, Waukegan Harbor, Montrose Harbor, and Diversey Harbor) and two launch ramps (Waukegan Harbor and Calumet Park) were visited by creel clerks using data collection methods utilized in the main creel survey. Estimates of daily catches (Tables 15 and 16) were computed as described in the main text. Notable catches of brown trout were seen at Waukegan Power Plant, and notable catches of coho salmon were taken by boaters using Calumet Park and by pedestrians fishing in or near Montrose Harbor. When those daily estimates are extrapolated across the entire three-week period of interest, it is estimated that 738 brown trout were caught at Waukegan Power Plant, 2470 coho salmon were caught by pedestrians at Montrose Harbor, and 1313 coho salmon were caught by boaters using Calumet Park. Those numbers approximate the estimated catches at those locations during the first three weeks of the regular summer creel survey (Tables 5a and 6).

Table 15. Daily pre-season catches by pedestrians (weekend days)

LOCATION/DATE	EFFORT (hours)	CATCH yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
Wau'Power, 3/17	403	0	11	7	0	0	0
Wau'Power, 3/24	311	0	83	0	0	0	0
Wau'Harbor,3/17	125	0	0	0	0	0	0
Wau'Harbor,3/24	108	0	0	0	0	0	0
Montrose, 3/17	488	20	0	0	0	139	0
Montrose, 3/24	979	0	0	0	0	177	0
Diversey, 3/17	26	0	0	0	0	0	0
Diversey, 3/24	34	0	6	6	0	0	0

Table 16. Daily pre-season catches by boaters (weekend days)

LOCATION/DATE	EFFORT (hours)	CATCH yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
Calumet, 3/17	212	0	3	0	0	60	0
Calumet, 3/24	459	0	33	0	0	209	0
Wau'Harbor,3/17	35	0	0	0	0	0	0
Wau'Harbor,3/24	71	0	0	0	0	9	0

IX APPENDIX D - SNAGGING SURVEY

A survey of snagging was conducted from October 1 through November 18, 1990. During that period a creel clerk visited each of the four legal snagging areas (Waukegan Harbor, Winnetka Power Plant discharge area, Diversey Harbor, and Jackson Park) on 15 days (eight weekdays and seven weekend days). Up to 10 snaggers were interviewed on each occasion using methods described above. The only difference in methods between this survey and the main summer survey of pedestrian anglers was that the time of day of the interviews was not specified in advance. Instead the creel clerk simply visited all sites on the randomly selected days, with the time of arrival at each location left to his/her discretion. Results of the survey of snagging are summarized in Tables 17 and 18.

Table 17. Expenditures by snaggers

LOCATION	EFFORT (angler-trips)	EXPENDITURES major (boat)	minor (gear)	other (travel)
Waukegan	1,613	$0	$10,987	$4,679
Winnetka	137	$0	$930	$396
Diversey	3304	$0	$22,502	$9,582
Jackson	2732	$0	$18,603	$7,922

Table 18. Catch by snaggers

LOCATION	EFFORT (angler-hours)	CATCH yellow perch	brown trout	r'bow trout	lake trout	coho salm'	chin salm'
Waukegan	6,954	0	16	0	0	103	489
Winnetka	589	0	0	0	0	0	0
Diversey	14,241	0	32	12	0	39	946
Jackson	11,774	0	0	0	0	60	1632